

What is claimed is:

1. An ink sheet cartridge comprising:

four spools;

5 a cartridge body that rotatably supports the four spools;

an intermediate connector having a substantially-cylindrical shape and detachably connected to one of the four spools and unconnected to remaining three of the four spools;

10 a supply-side core tube having two ends opposite from each other;

a takeup-side core tube having two ends opposite from each other; and

15 an ink sheet wound around and expanding between the supply-side core tube and the takeup-side core tube, wherein

the intermediate connector and the remaining three of the four spools are detachably engaged with the corresponding ends of the supply-side core tube and the takeup-side core tube.

20 2. The ink sheet cartridge according to claim 1, wherein the intermediate connector includes a cam portion, and the one of the four spools is formed with an engagement pawl for engaging the cam portion.

25 3. The ink sheet cartridge according to claim 2, wherein the cartridge body includes a side plate formed with

a supporting hole, and the one of the four spools includes a rotation member and a shaft member, the rotation member including a transmission gear and a resilient member protruding from the transmission gear, the shaft member including a flange and being unreleasably engaged with the rotation member within the supporting hole while interposing the side plate between the transmission gear and the flange, wherein the cam portion has an inner diameter portion that engages the engagement pawl, the engagement pawl being provided at a tip end of the resilient member.

4. The ink sheet cartridge according to claim 3, wherein the inner diameter portion of the cam portion is divided in a radial direction, and the rotation member is rotatable in a winding direction and an unwinding direction opposite from the winding direction, and the engagement pawl of the rotation member engages the cam portion only when the rotation member rotates in the winding direction in order to integrally rotation the intermediate connector in the winding direction.

5. The ink sheet cartridge according to claim 1, wherein the intermediate connector has an outer diameter, and the takeup-side core tube has an outer diameter equal to the outer diameter of the intermediate connector, wherein one of the two ends of the takeup-side core tube is formed with an engagement groove, and the intermediate connector

has an engagement protrusion engageable with the engagement groove.

6. The ink sheet cartridge according to claim 1, wherein the intermediate connector and the remaining three  
5 of the four spools are detachable from the corresponding ends of the supply-side core tube and the takeup-side core tube without detaching the one of the four spools from the cartridge body.

7. The ink sheet cartridge according to claim 6,  
10 wherein the cartridge body includes a side plate formed with a support hole, and the one of the four spools includes a shaft member and a rotation member engageable with the shaft member, the shaft member including a flange, the rotation  
15 member including a transmission gear, wherein rotation member engages the shaft member within the support hole while the flange and the transmission gear sandwich the side plate therebetween.

8. The ink sheet cartridge according to claim 7, wherein the shaft member further includes an engagement  
20 member protruding from the flange for engaging the rotation member, and the side plate has an inner side and an outer side opposite from the inner side, the engagement member engaging the rotation member within the support hole such  
25 that the flange is positioned the inner side of the side plate and the transmission gear is positioned the outer side

of the side plate.

9. The ink sheet cartridge according to claim 7,  
wherein the shaft member and the rotation member engaged  
with the shaft member together define an engagement portion  
5 that functions as a rotational center of the one of the four  
spools.

10. The ink sheet cartridge according to claim 1,  
wherein the one of the four spools is formed with an  
engagement hole, and one of the ends of the supply-side core  
10 tube and the takeup-side core tube is formed with an  
engagement groove, and the intermediate connector is formed  
with a first protrusion for engaging the engagement hole and  
a second protrusion for engaging the engagement groove.

11. The ink sheet cartridge according to claim 10,  
15 wherein the one of the four spools includes a shaft member  
and a rotation member engageable with the shaft member, the  
shaft member including a flange, the rotation member  
including a transmission gear, and the cartridge body  
includes a side plate formed with a support hole, wherein  
20 the shaft member and the rotation member engages each other  
within the support hole while interposing the side plate  
between the flange and the transmission gear, and the flange  
is formed with a plurality of engagement holes arranged in a  
peripheral direction of the flange.

25 12. The ink sheet cartridge according to claim 1,

wherein the intermediate connector is formed from a material having a relatively high friction coefficient and serves as a torque limiter that regulates transmission of torque from the one of the four spools to one of the supply-side core tube and the takeup-side core tube.

13. The ink sheet cartridge according to claim 12, wherein the intermediate connector is formed from a rubber.

14. The ink sheet cartridge according to claim 13, wherein the intermediate connector is rotatable with respect to the one of the ends of the supply-side core tube and the takeup-side core tube.

15. An ink sheet cartridge comprising:

four spools;

a cartridge body that rotatably supports the four spools;

a supply-side core tube having two ends opposite from each other;

a takeup-side core tube having two ends opposite from each other; and

an ink sheet wound around and expanding between the supply-side core tube and the takeup-side core tube, wherein

the four spools are detachably engaged with the corresponding ends of the supply-side core tube and the takeup-side core tube, and

one of the four spools has an engagement pawl, and one

of the supply-side core tube and the takeup-side core tube is provided with an engagement member for engaging the engagement pawl.

16. The ink sheet cartridge according to claim 15,  
5 wherein the one of the supply-side core tube and the takeup-side core tube has an inner peripheral surface, and the engagement member has a projection inwardly protruding from the inner peripheral surface.

17. The ink sheet cartridge according to claim 16,  
10 wherein the one of the supply-side core tube and the takeup-side core tube is formed with a receiving hole, and the projection is inserted into and penetrates the receiving hole from an outer side of the one of the supply-side core tube and the takeup-side core tube, and is fixed thereto.

18. The ink sheet cartridge according to claim 15,  
15 wherein the engagement member is formed with an engagement hole, and the one of the supply-side core tube and the takeup-side core tube has a hollow inside, wherein when the engagement pawl is positioned inside the one of the supply-side core tube and the takeup-side core tube, the engagement pawl is in engagement with the engagement hole.

19. The ink sheet cartridge according to claim 15,  
20 wherein the one of the supply-side core tube and the takeup-side core tube has a hollow inside, and the engagement member is formed with an engagement groove for engaging the

engagement pawl when the engagement pawl is positioned inside the one of the supply-side core tube and the takeup-side core tube.

20. The ink sheet cartridge according to claim 15,  
5 wherein the supply-side core tube and the takeup-side core tube are detachable from the corresponding ones of the four spools without detaching the one of the four spools from the cartridge body, and the cartridge body includes a side plate formed with a support hole, and the one of the four spools  
10 includes a shaft member and a rotation member engageable with the shaft member, the shaft member including a flange and a resilient protrusion extending from the flange in an axial direction of the flange and urged in a radial direction of the flange and having a tip end opposite from  
15 the flange, the rotation member including a transmission gear, wherein rotation member engages the shaft member within the support hole while the flange and the transmission gear sandwich the side plate therebetween, and the engagement pawl is provided at the tip end of the  
20 resilient protrusion.

21. An ink sheet set detachably mountable on an ink sheet cartridge including four spools, a cartridge body freely rotatably supporting the four spools, and an intermediate connector having a substantially-cylindrical  
25 shape and connected to one of the four spools and

unconnected to remaining three of the four spools, the ink sheet set comprising:

a supply-side core tube having two ends opposite from each other;

5 a takeup-side core tube having two ends opposite from each other; and

an ink sheet wound around and expanding between the supply-side core tube and the takeup-side core tube, wherein

each of the ends of the supply-side core tube and the  
10 takeup-side core tube is detachably engageable with corresponding one of the intermediate connector and the remaining three of the four spools.

22. The ink sheet set according to claim 21, wherein the takeup-side core tube has an outer diameter equal to an  
15 outer diameter of the intermediate connector, and one of the ends of the takeup-side core tube is formed with an engagement groove engageable with an engagement protrusion formed to the intermediate connector.

23. An ink sheet set detachably mountable on an ink  
20 sheet cartridge including four spools and a cartridge body rotatably supporting the four spools, one of the four spools having an engagement pawl, the ink sheet set comprising:

a supply-side core tube having two ends opposite from each other;

25 a takeup-side core tube having two ends opposite from



each other; and

an ink sheet wound around and expanding between the supply-side core tube and the takeup-side core tube, wherein

each of the ends of the supply-side core tube and the  
5 takeup-side core tube detachably engages corresponding one of the four spools, and

one of the supply-side core tube and the takeup-side core tube is provided with an engagement member for engaging the engagement pawl.

10 24. The ink sheet set according to claim 23, wherein the one of the supply-side core tube and the takeup-side core tube has an inner peripheral surface, and the engagement member has a projection inwardly protruding from the inner peripheral surface.

15 25. The ink sheet set according to claim 24, wherein the one of the supply-side core tube and the takeup-side core tube is formed with a receiving hole, and the projection is inserted into and penetrates the receiving hole from an outer side of the one of the supply-side core  
20 tube and the takeup-side core tube, and is fixed thereto.

26. The ink sheet set according to claim 23, wherein the engagement member is formed with an engagement hole, and the one of the supply-side core tube and the takeup-side core tube has a hollow inside, wherein when the engagement  
25 pawl is positioned inside the one of the supply-side core

tube and the takeup-side core tube, the engagement pawl is in engagement with the engagement hole.

27. The ink sheet set according to claim 23, wherein the one of the supply-side core tube and the takeup-side core tube has a hollow inside, and the engagement member is  
5 formed with an engagement groove for engaging the engagement pawl when the engagement pawl is positioned inside the one of the supply-side core tube and the takeup-side core tube.

28. An ink sheet set detachably mountable on an ink  
10 sheet cartridge including four spools and a cartridge body freely rotatably supporting the four spools, the ink sheet set comprising:

a supply-side core tube having two ends opposite from each other;

15 a takeup-side core tube having two ends opposite from each other;

an ink sheet wound around and expanding between the supply-side core tube and the takeup-side core tube; and

an intermediate connector having a substantially-cylindrical shape, the intermediate connector being  
20 detachably engaged with one of the ends of the supply-side core tube and the takeup-side core tube and unengaged with remaining three of the ends of the supply-side core tube and takeup-side core tube, wherein

25 the intermediate connector and the remaining three of

the ends are engageable with corresponding ones of the four spools.

29. The ink sheet set according to claim 28, wherein the intermediate connector has a cam portion engageable with an engagement pawl formed to one of the four spools.

30. The ink sheet set according to claim 29, wherein the cam portion is in engagement with the engagement pawl when the one of the four spools rotates in a winding direction and in disengagement with the engagement pawl when the one of the four spools rotates in an unwinding direction opposite from the winding direction.

31. The ink sheet set according to claim 28, wherein the intermediate connector has an outer diameter, and the takeup-side core tube has an outer diameter equal to the outer diameter of the intermediate connector, and the one of the ends of the takeup-side core tube is formed with an engagement groove, and the intermediate connector is formed with an engagement protrusion engageable with the engagement groove.

32. The ink sheet set according to claim 28, wherein the intermediate connector is formed with a plurality of engagement protrusions engageable with corresponding ones of engagement grooves formed to the one of the four spools.

33. The ink sheet set according to claim 28, wherein the intermediate connector is formed from a material having

a relatively high friction coefficient and serves as a torque limiter that regulates transmission of torque from the one of the four spools to one of the supply-side core tube and the takeup-side core tube.

5           34. The ink sheet set according to claim 33, wherein the intermediate connector is formed from a rubber.

          35. The ink sheet set according to claim 34, wherein the intermediate connector is rotatable with respect to the one of the ends of the supply-side core tube and the takeup-  
10       side core tube.

          36. An intermediate connector for use in an ink sheet cartridge of an image forming device, the ink sheet cartridge including four spools each having an outer diameter portion, a cartridge body freely rotatably  
15       supporting the four spools, a pair of core tubes each having two ends and an inner diameter portion, and an ink sheet wound around and expanding between the pair of core tubes, the intermediate connector comprising:

          a body having a substantially-cylindrical shape having  
20       a first portion that is insertable into the inner diameter portion of one of the pair of core tubes and a second portion integrally formed with the first portion, the second portion having an inner diameter portion receivable the outer diameter portion of one of the four spools, thereby  
25       connecting the one of the four spools with the one of the

pair of core tubes.

37. The intermediate connector according to claim 36, wherein the body is formed with a cam portion that engages an engagement pawl formed to the one of the four spools.

5 38. The intermediate connector according to claim 37, wherein the cam portion is formed to the inner diameter portion of the second portion.

39. The intermediate connector according to claim 38, wherein the inner diameter portion is divided in a radial  
10 direction, thereby defining the cam portion, the cam portion being in engagement with the engagement pawl when the one of the spools rotates in a winding direction and in disengagement with the engagement pawl when the one of the spools rotates in an unwinding direction opposite from the  
15 winding direction.

40. The intermediate connector according to claim 36, wherein the second portion has an outermost diameter that is equal to an outer diameter of the one of the pair of core tubes, and the second portion is formed with an engagement  
20 protrusion engageable with an engagement groove formed to the one of the ends of the pair of core tubes.

41. The intermediate connector according to claim 36, wherein the second portion has a side surface formed with a protrusion that detachably engages an engagement hole formed  
25 to the one of the four spools.

42. The intermediate connector according to claim 41,  
wherein the second portion of the body further includes an  
another protrusion that detachably engages an engagement  
groove formed to the one of the ends of the pair of core  
5 tubes.

43. The intermediate connector according to claim 36,  
wherein the body is formed from a material having a  
relatively high friction coefficient and serves as a torque  
limiter that regulates transmission of torque from the one  
10 of the four spools to the one of the pair of core tubes.

44. The intermediate connector according to claim 43,  
wherein the body is formed from a rubber.

45. The intermediate connector according to claim 44,  
wherein the body is rotatable with respect to the one of the  
15 ends of the pair of core tubes.

46. A cartridge set used in an ink sheet cartridge of  
an image forming device, the ink sheet cartridge including  
four spools and a cartridge body freely rotatably supporting  
the four spools, the cartridge set comprising:

20 a takeup-side core tube having two ends opposite from  
each other; and

an intermediate connector having a substantially-  
cylindrical shape, the intermediate connector connecting one  
of the two ends of the takeup-side core tube and one of the  
25 four spools.

47. The cartridge set according to claim 46, wherein the intermediate connector is formed with a cam portion engageable with an engagement pawl formed to one of the four spools.

5 48. The cartridge set according to claim 47, wherein the cam portion of the intermediate connector has an inner diameter portion that is engageable with the engagement pawl.

49. The cartridge set according to claim 48, wherein the inner diameter portion is divided in a radial direction, 10 the inner diameter portion being in engagement with the engagement pawl when the one of the spools rotates in a winding direction and in disengagement with the engagement pawl when the one of the spools rotates in an unwinding direction opposite from the winding direction.

15 50. The cartridge set according to claim 46, wherein the intermediate connector has an outer diameter, and the takeup-side core tube has an outer diameter that is equal to the outer diameter of the intermediate connector, and the one of the ends of the takeup-side core tube is formed with 20 an engagement groove, and the intermediate connector is formed with an engagement protrusion engageable with the engagement groove.

51. The cartridge set according to claim 46, wherein the one of the two ends of the takeup-side core tube is 25 formed with an engagement groove, and the intermediate

connector is formed with a first protrusion engageable with the engagement groove and a second protrusion engageable with an engagement hole formed to the one of four spools.

52. The cartridge set according to claim 46, wherein  
5 the intermediate connector is formed from a material having a relatively high friction coefficient and serves as a torque limiter that regulates transmission of torque from the one of the four spools to one of the ends of the takeup-side core tube.

10 53. The cartridge set according to claim 52, wherein the intermediate connector is formed from a rubber.

54. The cartridge set according to claim 53, wherein the intermediate connector is rotatable with respect to the one of the ends of the takeup-side core tube.

15 55. A core tube used in an ink sheet cartridge of an image forming device, and ink sheet cartridge including four spools, a cartridge body rotatably supporting the four spools, and an intermediate connector detachably connected to one of the four spools, the core tube comprising:

20 a body having a cylindrical shape with two ends opposite from each other, one of the two ends being engageable with the intermediate connector.

56. The core tube according to claim 55, wherein the body is formed with an engagement groove that is engageable  
25 with an engagement protrusion formed to the intermediate



connector.

57. The core tube according to claim 56, wherein the body has an outer diameter equal to an outermost diameter of the intermediate connector.

5 58. A core tube detachably mountable on an ink sheet cartridge including four spools and a cartridge body rotatably supporting the four spools, one of the four spools having an engagement pawl, the core tube comprising:

10 a cylindrical body having two ends opposite from each other, one of the two ends detachably engageable with the one of the four spools, wherein the cylindrical body includes an engagement member for engaging the engagement pawl.

15 59. The core tube according to claim 58, wherein the cylindrical body has an inner peripheral surface, and the engagement member has a projection inwardly protruding from the inner peripheral surface.

20 60. The core tube according to claim 59, wherein the cylindrical body is formed with a receiving hole, and the projection is inserted into and penetrates the receiving hole from an outer side of the one of the supply-side core tube and the takeup-side core tube, and is fixed thereto.

25 61. The core tube according to claim 58, wherein the cylindrical body has a hollow inside, and the engagement member is formed with an engagement hole, wherein when the

engagement pawl is positioned inside the cylindrical body,  
the engagement pawl is in engagement with the engagement  
hole.

62. The core tube according to claim 58, wherein the  
5 cylindrical body has a hollow inside, and the engagement  
member is formed with an engagement groove for engaging the  
engagement pawl when the engagement pawl is positioned  
inside the cylindrical body.

63. An ink sheet set, comprising:  
10 a supply-side core tube having two ends opposite from  
each other;  
a takeup-side core tube having two ends opposite from  
each other;  
an ink sheet wound around and expanding between the  
15 supply-side core tube and the takeup-side core tube; and  
an intermediate connector having a substantially-  
cylindrical shape, the intermediate connector being engaged  
with one of the ends of the supply-side core tube and the  
takeup-side core tube.

64. The ink sheet set according to claim 63, wherein  
20 the intermediate connector is unengaged with remaining three  
of the ends of the supply side core tube and takeup-side  
core tube.

65. An intermediate connector for use in an ink sheet  
25 set including a pair of core tubes each having two ends and

an inner diameter portion, and an ink sheet wound around and expanding between the pair of core tubes, the intermediate connector comprising:

5 a body having a substantially-cylindrical shape having a first portion that is insertable into the inner diameter portion of one of the pair of core tubes and a second portion integrally formed with the first portion.

66. The intermediate connector according to claim 65, wherein the intermediate connector receives a specific spool  
10 having an engagement pawl.

67. The intermediate connector according to claim 66, wherein the body is formed with a cam portion that engages the engagement pawl formed to the specific spool.

68. A core tube used in an ink sheet set including an  
15 intermediate connector and an ink sheet, the core tube comprising:

a body having a cylindrical shape with two ends opposite from each other, one of the two ends being engageable with the intermediate connector.

20 69. The core tube according to claim 68, wherein the body is formed with an engagement groove that is engageable with an engagement protrusion formed to the intermediate connector.

70. The core tube according to claim 69, wherein the  
25 body has an outer diameter equal to an outermost diameter of

the intermediate connector.

71. A core tube used in an ink sheet cartridge,  
comprising:

5 a cylindrical body having two ends detachably  
engageable with a specific spool having an engagement pawl,  
wherein the cylindrical body includes an engagement member  
for engaging the engagement pawl.

72. The core tube according to claim 71, wherein the  
cylindrical body has an inner peripheral surface, and the  
10 engagement member has a projection inwardly protruding from  
the inner peripheral surface.

73. The core tube according to claim 72, wherein the  
cylindrical body is formed with a receiving hole, and the  
projection is inserted into and penetrates the receiving  
15 hole from an outer side of the cylindrical body and is fixed  
thereto.

74. The core tube according to claim 71, wherein the  
cylindrical body has a hollow inside, and the engagement  
member is formed with an engagement hole, wherein when the  
20 engagement pawl is positioned inside the cylindrical body,  
the engagement pawl is in engagement with the engagement  
hole.

75. The core tube according to claim 71, wherein the  
cylindrical body has a hollow inside, and the engagement  
25 member is formed with an engagement groove for engaging the

engagement pawl when the engagement pawl is positioned inside the cylindrical body.

76. An ink sheet cartridge comprising:

at least three spools;

5 a cartridge body that rotatably supports the spools;

an intermediate connector having a substantially-cylindrical shape and detachably connected to one of the at least three spools and unconnected to remaining spools of the at least three spools;

10 a supply-side core tube having two ends opposite from each other;

a takeup-side core tube having two ends opposite from each other; and

15 an ink sheet wound around and expanding between the supply-side core tube and the takeup-side core tube, wherein the intermediate connector and the remaining spools of the at least three spools are detachably engaged with the corresponding ends of the supply-side core tube and the takeup-side core tube.

20 77. The ink sheet cartridge according to claim 76, wherein one of the remaining spools is detachably engaged with the opposite end of the end that the intermediate connector is engaged.

25 78. The ink sheet cartridge according to claim 77, wherein the other spools of the remaining spools is

detachably engaged with the other core tube than the one that the intermediate connector is engaged.

79. An ink sheet cartridge comprising:

5 a tube-like supply-side member having two ends opposite from each other, a shaft being provided at the two ends respectively;

a tube-like takeup-side member having two ends opposite from each other, a shaft being provided at one end;  
10 an intermediate connector having a substantially-cylindrical shape and detachably connected to the other end of the tube-like takeup-side member;

a specific spool detachably engageable to the intermediate connector, the specific spool having a shaft;

a cartridge body that rotatably supports the shafts;  
15 and

an ink sheet wound around and expanding between the tube-like supply-side member and the tube-like takeup-side member.

80. An ink sheet cartridge comprising:

20 a tube-like supply-side member having two ends opposite from each other, a shaft being provided at the two ends respectively;

a tube-like takeup-side member having two ends opposite from each other, a shaft being provided at one end  
25 and an engageable member being provided at the other end;

a specific spool detachably engageable to the other end of the tube-like takeup-side member, the specific spool having a shaft and an engageable pawl opposite to the shaft, the engageable pawl being engageable with the engageable member of the tube-like takeup-side member;

a cartridge body that rotatably supports the shafts; and

an ink sheet wound around and expanding between the tube-like supply-side member and the tube-like takeup-side member.

81. An ink sheet cartridge comprising:

a supply-side core tube having two ends opposite from each other;

a takeup-side core tube having two ends opposite from each other;

at least two spools that includes a specific spool having an engagement pawl, each spools being detachably engageable with corresponding core tube respectively;

a cartridge body that rotatably supports the spools;

an ink sheet wound around and expanding between the supply-side core tube and the takeup-side core tube, wherein one of the supply-side core tube and takeup-side core tube includes an engagement member for engaging the engagement pawl of the specific spool.

82. The ink sheet cartridge according to claim 81,

wherein one of the supply-side core tube and takeup-side core tube has an inner peripheral surface, and the engagement member has a projection inwardly protruding from the inner peripheral surface.

5           83. The core tube according to claim 82, wherein one of the supply-side core tube and takeup-side core tube is formed with a receiving hole, and the projection is inserted into and penetrates the receiving hole from an outer side of the core tube and is fixed thereto.

10           84. The core tube according to claim 81, wherein one of the supply-side core tube and takeup-side core tube has a hollow inside, and the engagement member is formed with an engagement hole, wherein when the engagement pawl is positioned inside the core tube, the engagement pawl is in  
15           engagement with the engagement hole.

          85. The core tube according to claim 81, wherein one of the supply-side core tube and takeup-side core tube has a hollow inside, and the engagement member is formed with an engagement groove for engaging the engagement pawl when the  
20           engagement pawl is positioned inside the core tube.